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NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA
UTILITIES DEPARTMENT

STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS

TITLE

REPLACE TRANSFORMER - 3 OR 1 PHASE PAD TYPE

PROCEDURE NUMBER

WC 624 HVE 053

SIGNED:_____

(DATE)

APPROVED:_____

(DATE)

SAFETY PROFESSIONAL:_____

(DATE)

MANAGEMENT OFFICIAL:_____

(DATE)

REVISION A

REPLACE TRANSFORMER - 3 OR 1 PHASE PAD TYPE

DISTRIBUTION

CODE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE
601.C3							
620							
622							
610.E1							
622.3							

REVISIONS

REV	DESCRIPTION	SIGNATURE	DATE
A	Initial Issue.		

REPLACE TRANSFORMER - 3 OR 1 PHASE PAD TYPE

Purpose:
Procedure to replace a three phase, or one phase pad style transformer.

Potential Energy Sources:
1. 34.5/11.5/4.16 kv cables and equipment.
2. Generators if installed at facilities to provide temporary power during the transformer change out.

Tools and PPE:
Tools: Auger truck, certified slings, chain hoists, machine casters, machine roll bars, rope, hand tools, high voltage tester, Multimeter, and phase rotation meter. PPE: Nomex coveralls, Nomex hood, insulating rubber gloves, insulating rubber sleeves, hard hat, safety shoes, work gloves, safety glasses, and back brace if required by back injury prevention and control program. The class of rubber gloves and sleeves will depend on the exposure voltage as per the following: Class 0 - up to 1,000 volts, Class
1 - up to 7,500 volts, Class 2 - up to 17,000 volts, Class 3 - up to 26,500 volts, Class 4 - up to 36,000 volts.

References:
1. PWC Occupational Safety and Health Program Manual, PWCNORVAINST 5100.33E
2. Occupational Safety and Health Standards for General Industry (29 CFR PART 1910): Subpart I, Personnel Protective Equipment; Subpart R, Electrical Power Generation / Transmission / Distribution; Subpart S, Electrical
3. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.
4. SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger Truck
5. SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)
6. SOP WC 622 HVE 007, Switchout And Switchback Energized Circuit

Procedures:
1. Check the facility's phase rotation with a phase rotation meter prior to operations personnel's outage switching. If the facility's power voltage is less than 300 volts, wear Nomex coveralls, safety shoes, and hard hat, and avoid contact with energized components while measuring the voltage. If the facility's voltage is greater than 300 volts, wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, and insulating rubber gloves.

2. Operations personnel will deenergize the primary circuit per SOPs
    a) WC 622 HVE 007, Switchout and Switchback Energized Circuit
    b) WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)

Operations personnel will ensure that the facility's emergency generator or temporary power generator, if present, is isolated and will not back feed to the transformer.

3. Using a high voltage tester test the primary circuit's cables to verify they are deenergized. Before the conductors are checked, test the high voltage tester on a known energized circuit to verify the tester is working. Test each deenergized conductor separately, taking care not to cross

phase during test. If voltage is detected, stop the test and (a) notify operations personnel that the circuit is still energized, (b) wait for operations personnel to correct the problem, (c) perform the deenergization verification test once again after WC 622 personnel finish switching operations and declare the cables deenergized. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly. Wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, insulating rubber gloves and sleeves, and hard hat while testing.

4. Test the transformer's secondary side for voltage. If the facility's power voltage is less than 300 volts, wear Nomex coveralls, safety shoes, and hard hat, and avoid contact with energized components while measuring the voltage. If the facility's voltage is greater than 300 volts, wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, and insulating rubber gloves. If voltage is detected, stop the test and (a) notify WC 622 personnel that the secondary is still energized, (b) wait for WC 622 personnel to correct the problem, (c) perform the deenergization verification test once again after WC 622 personnel finish switching operations and declare the secondary side is deenergized.

The PPE for the change out work will include work gloves, safety shoes, safety glasses, and hard hats. Refer to the JHA for further information.

5. Using colored phasing tape identify the primary cables and then disconnect them from the transformer's primary bushings. Identify which cable was connected to the H1 terminal, which cable was connected to the H2 terminal, and which cable was connected to the H3 terminal.

6. Depending on the particular installation, identify secondary phase wires, neutrals, grounds, and metering circuits. Disconnect any or all of these wires from the transformer's secondary bushings.

7. Disconnect the transformer's case grounds.

8. Set up auger truck. Refer to SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger truck for details.

Outdoor Installation

9. Connect a certified steel sling from the auger truck's boom winch to the transformer. Lift and remove the unit. Set the transformer on the stake body truck for transporting to storage/disposal site.

10. Connect a certified steel sling from the auger truck's boom winch to the replacement transformer, lift, and put the transformer in place. Exercise care to not damage the primary and secondary cables.

Indoor Installation

9. Using chain hoists, machine casters, machine roller bars, rope, Auger truck with certified sling, etc., move the transformer outside the facility. Using a certified sling, attach the transformer to the auger truck's boom winch. Lift and set the unit on the stake body truck for transporting to storage/disposal site.

11. Using a certified sling, attach the new pad transformer to the auger truck's boom winch. Lift and set the new transformer close to, or inside the facility door. Using chain hoists, machine casters, machine roller bars, rope, Auger truck with certified sling, etc., put the new pad transformer in place.

11. Secure the auger truck. Refer to SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger truck for details.

12. Reconnect case grounds.

13. Reconnect the secondary phase wires, neutrals, grounds, and metering circuits. Reconnect the phase wires per the markings made when these cables were disconnected.

14. Reconnect the primary conductors per the markings made when these cables were disconnected.

Three Phase Transformer
15. Operations personnel will remove grounds and reenergize the circuit and transformer in order to allow testing of the facility's voltage and phase rotation. WC 622 will follow SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout).

16. Check the secondary voltage and phase rotation with a phase rotation meter and compare this with the check performed prior to the transformer change out. Wear PPE per Step 1.

If the rotation has reversed, operations personnel will deenergize the circuit and transformer once again and place grounds as per SOP WC 622 HVE 013. After the unit is deenergized, exchange two secondary phase connections on the transformer, then operations personnel will remove grounds and reenergize the unit so the phase rotation can be checked once again.

If Step 1 of this procedure was not done, then to check the rotation, locate a 3 phase motor to verify it's rotation is correct.

If the phase rotation is correct proceed to Step 17.

Three and One Phase Transformer
17. Operations personnel will energize the primary circuit and transformer per SOPs
    a) WC 622 HVE 007, Switchout and Switchback Energized Circuit
    b) WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)

18. Check the Watt-Hour meter operation if meter is present. Wear Nomex coveralls while checking. Correct any problems found.

END